ICAM8 Abstracts

Stratigraphy & biostratigraphy

Stratigraphy and trilobite biofacies of the Late Ordovician (Katian) of the Taimyr Peninsula, Arctic Russia

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The thick Late Ordovician (Katian) succession on the Taimyr Peninsula, Arctic Russia is divided into three regions showing a transition from a southern carbonate dominated facies, a central transitional facies, and a siliciclastic dominated northern facies. All regions are rich in trilobites but hitherto only the southern fauna was described. New collections have been added to this and allow a division into two very different biofacies for the Katian succession. Black limestone and shales have taxa similar to those of the peripheral Laurentian Scoto-Appalachian belt (Ampyxella, Ampxyina, Failleana, Pararemopleurides, Raymondella, Remopleurides, Robergia, Stygina, Taimyraspis, Telephina, and Toernquistia), and is termed the raphiophorid association. Further subdivisions may be possible, but the small number of new collections does not allow this at the moment. From shelf limestone a contrasting fauna contains monorakine trilobites (Carinopyge, Ceratevenkaspis, Elasmaspis, Evenkaspis, and Monorakos) endemic to the Siberian platform. Trilobites such as isotelines, Calyptaulax, Xylabion, and Cheirurus otherwise typical of inshore Laurentia co-occur with this fauna. This biofacies is termed the monorakine-cheirurid-illaenid association. Our results show that the Taimyr Peninsula, as an open shelf marginal to the Siberian Platform, typically would have the endemic monorakine-cheirurid-illaenid association, while similar conditions to those on the eastern fringes of the Iapetus Ocean permitted a short lived establishment of comparable faunas of the raphiophorid association.

Upper Ordovician-lower Silurian stratigraphy and palaeogeography of Severnaya Zemlya and New Siberian Islands (Arctic Russia)

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The Severnaya Zemlya Archipelago (SZA) and New Siberian Islands (NSI) are located close to the Eurasian Arctic Shelf margin, SZA between the Kara and Laptev seas and NSI between the Laptev and East Siberian seas. SZA constitutes one of the main land areas of the North Kara Terrane (NKT) location of which in the Early Palaeozoic is problematic. Palaeontological and sedimentological data are equivocal: some suggest close connections with Baltica, others with Siberia. Conodonts, providing reliable dating of strata, bear also valuable information about palaeogeographic affinities of the regions. The data available shows that conodont assemblage from SZA is identical to the fauna of the Timan-northern Urals region. This agrees with the provenance studies indicating that NKT was part of the Timanide margin of Baltica at least since the Late Precambrian.

Recent data from NSI imply that the Upper Ordovician conodont fauna yields, together with cosmopolitan taxa, a number of species characteristic of Siberia suggesting close connections between these two regions. The proximity of NSI to Siberia is also indicated by similarities of lithology and other fossil assemblages. Additionally, similar trends in changes of sedimentary environment during Late Ordovician to early Silurian in the three regions around Laptev Sea: NSI (Kotel'ny Island), central and southern Taimyr, and the Siberian Platform point that all of them might have been located in the same sedimentary basin.

Phanerozoic glendonite distribution and their significance for reconstruction of high-latitude palaeoenvironments

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Glendonites are calcite pseudomorphs after ikaite. Here results of thorough survey of available data about glendonite occurrences coupled with information about palaeolatitudes are provided. Oldest Phanerozoic glendonites are came from Carboniferous of the Southern hemisphere. During the Permian glendonite occurrences became numerous and since the Middle Permian they are known from the both Northern and Southern hemispheres. Triassic glendonites are unknown, but in the Late Pliensbachian they became very abundant. Early Toarcian OAE coincides with disappearance of glendonites. Later high-latitude cooling in the Northern hemisphere leads to gradual increase of glendonite abundance during the Middle Jurassic followed by decline towards the Late Jurassic. All Jurassic glendonite occurrences are known from the Northern hemisphere only. During the Early Cretaceous two peaks of glendonite abundance are recognized – Late Valanginian and Late Aptian; glendonites of this age are well-known from the both northern and southern hemispheres. Paleogene glendonite records are known from two regions in the Northern hemisphere, which are northern Atlantic region (Denmark and Spitsbergen) and Northern Pacific. During the Neogene all glendonite occurrences became restricted to north of Pacific Rim. Quaternary occurrences of glendonites are most geographically widely distributed. Although all these glendonite records are clearly associated with glaciations or cooling events, additional factors controlling their occurrences remains unclear.

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Palynostratigraphy and Carbon Isotope Stratigraphy of Permian-Triassic (P-T) Strata in the Timan-Pechora basin.

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Permian-Triassic (PT) strata were studied in 4 cores located alongside an E-W transect from the eastern Barents Sea to the eastern part of the Pechora Sea. Twenty-five samples were analyzed for palynology, palynofacies and bulk C-isotope composition to improve the stratigraphic correlation of the P-T transition. P-T sediments comprise shallow marine to continental mixed siliciclastic sediments with some limestone intercalations deposited on a shallow shelf with deltaic complexes and fluvial-estuarine sediments. All samples show a C-isotope composition of about -27 per mill. We did not find negative CIE. Some of the mud-siltstone samples yielded well preserved palynomorph assemblages dominated by taeniate and bisaccate pollen and spores. The maturity of the organic matter is low, TAS 1-2. The presence of acritarchs and amorphous organic matter particularly in the Upper Permian indicates a shallow marine depositional environment. Reduviasporonites and taeniate pollen (Weylandites, Vittatina) are indicative of the P-T boundary interval. The Early Triassic palynofacies is dominated by wood remains, cuticle fragments and some degraded amorphous matter characteristic for fluvio-deltaic sediments. However, we did not find any interval with spore dominated assemblages, as reported from Greenland, the Barents Sea or Svalbard. Our preliminary data may indicate a sedimentary hiatus at the P-T boundary in the Timan-Pechora basin or the absence of P-T boundary features reflects the rather low sampling density in the cores.

Early Cretaceous delta systems in the Barents Sea – paleogeography and links to the High Arctic Large Igneous Province (HALIP)

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The Lower Cretaceous sedimentary succession in the Barents Sea comprises large delta systems that prograded into a wide epicontinental basin. Seismic data show large-scale sedimentary lobes from NW with internal clinoform geometry interfingering with another large-scale system that prograded an even greater distance towards SW from the NE. The seismic data tied to boreholes are combined with field observations from Svalbard to provide information on timing and basin physiography, and its control on source-to-sink transport and depositional patterns. Intra-plate tectonics formed local areas of positive and negative accommodation that controlled sediment routing, orientation and position of the Early Cretaceous shoreline and corresponding facies distribution. The first delta system to reach the SW Barents Sea, in the Barremian, was sourced from an area north of Svalbard associated with the High Arctic Large Igneous Province (HALIP). The uplift of the source area, and the corresponding change in the regional paleogeography, appears to have started some time before the main magmatic event dated to 122-125 Ma. The regional uplift in the north imposed a north-south tilt of the entire Barents Shelf, including Svalbard. To reconstruct the Early Cretaceous paleogeography covering the entire source-to-sink system requires challenging plate reconstructions restoring the complex Eurekan fold and thrust belt and the opening history of the Arctic Ocean. Furthermore, to understand the vertical motion history we have to link surface and deep processes associated with the HALIP formation.

POSTER SESSION

Biostratigraphy and palaeontology of the lower Cambrian Duolbagáisá Formation on the Digermulen Peninsula, Arctic Norway

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The lower Cambrian sequence on the Digermulen Peninsula (Finnmark, Arctic Norway) is the northernmost extension of the Cambrian deposits along the Caledonian front. It is exceedingly thick compared to cratonal successions typical of most of Baltica. The Duolbagáisá Formation represents the youngest lower Cambrian unit on the peninsula with the first trilobite-bearing strata, a plethora of trace fossils including diverse arthropod traces and Plagiogmus arcuatus, and abundant and well-preserved organic walled microfossils (OWM). Extensive field work by the Digermulen Early Life Research Group allows for the first time a detailed appreciation of the age and faunal composition of the unit. The lower member is ~250 m thick with thin-bedded siltstone, sandstone and mudstone. A single unidentifiable holmiid thorax region occurs alongside arthropod trace fossils. OWM indicate the S. ornata-F. membranacea Zone. The upper member is ~390 m thick and consist of several upward shallowing parasequences with fine-grained sandstone, siltstone and mudstone followed by thick mature quartzite. The trace fossil Syringomorpha occurs throughout the upper member and Cruziana and Rusophycus are especially abundant in the upper parts. The first identifiable olenellid trilobites occur in a thick mudstone/siltstone interval at the middle of the member, along with an elliptocephalid trilobite and other arthropods. Abundant OWM indicate the H. dissimilare-S. ciliosa Zone with the higher levels belonging to the Volkovia-Liepaina Zone. The entire sequence thus span the Cambrian Series 2, stages 3–5.

Review of infrazonal ammonite biostratigraphy and palaeobiogeography of the Kimmeridgian Stage in Arctic

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Kimmeridgian deposits are widely distributed in Arctic. They are generally characterized by eudemic cardioceratid ammonites, which permits to recognize succession of zonal and infrazonal units, well-traced throughout this region and also in Subboreal areas. Only in East Greenland, Subpolar Urals and the Khatanga depression these ammonites are permanently associated with Subboreal aulacostephanids except the terminal Kimmeridgian. In other Boreal sites such as Spitsbergen, Barents Sea shelf, Franz-Josef Land, Western Siberia, Arctic Canada and British Columbia aulacostephanids are mainly restricted by two narrow intervals indicating short-time immigration events (cymodoce horizon of the Lower Kimmeridgian and sachsi horizon of the Upper Kimmeridgian). Base of the Kimmeridgian Stage marked by appearance of ammonite genus Plasmatites is well-traced through nearly all Boreal areas except NE Russia and Pacific region, in which these ammonites are unknown. Position of the Lower-Upper Kimmeridgian boundary in Arctic is nearly coincides with the base of the Modestum Subzone of the Kitchini Zone, although due to rarity or endemism in aulacostephanids this correlation could be considered as preliminary. Cardioceratids became extinct before the end of the Kimmeridgian, in the beginning of the Autissiodorensis Chron, and uppermost zone of the Boreal Kimmeridgian (Taimyrensis Zone) is characterized by eudemic oppeliids only. Position of the Kimmeridgian-Volgian boundary in Arctic is unclear; it is associated with regionally traced gap. This study has been supported by PRAS program 19.

Paleogene Eurekan deformation: dating of syn-sedimentary movement at Stenkul Fiord (Ellesmere Island, Canadian Arctic)

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At Stenkul Fiord, mainly fluvial clastic sediments with intercalated coals seams of the Margaret Formation were deposited during the Paleocene/Eocene. The sediments were affected by ongoing Eurekan deformation during the Paleogene. Attempts to refine the dating of these movements include detailed field studies and an interpreted satellite image. The clastic deposits consist of at least four sedimentary units separated by unconformities.

Volcanic ash layers of cm-thickness and preserved as crandallite group minerals occur in coal seams. New U-Pb zircon ages (ID-TIMS) reveal that the volcanic ash-fall took place at 53.7 Ma, i.e. within the range of the ETM-2 hyperthermal. Negative excursions of carbon isotopes of bulk coal and amber droplets indicate the likely extent of the ETM-2 hyperthermal in the section.

To overcome limitations of earlier sampling resolution, work is underway on more closely spaced samples including quantitative palynology. This is done also to prove that the dated volcanic ash layer is in the range of the negative isotope excursion.

Together the U-Pb zircon age and the position of the ETM-2 hyperthermal provide a new stratigraphic tie-point assigning sedimentary Unit 1 to the late Paleocene-earliest Eocene, Units 2, 3, and 4 to the early to middle Eocene and enabling to study the timing of syn-sedimentary movements, also causal for unconformities in the section.

Eustatic events on the Palaeozoic carbonate platform in the NE Baltica Palaeocontinent – comparative study of the biotic and abiotic changes

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The late Ludlow (Silurian) and Mid-Tournaisian (Carboniferous) eustatic and bioevents recorded in the Timan-Pechora region are compared. The upper Ludlow succession, dominated by mixed siliciclastic-carbonate deposits, contain numerous ostracods, brachiopods Didymothyris didyma, and conodonts among which rare specimens of Polygnathoides siluricus occur. Late Ludlow regression resulted in deposition of microbial carbonates in the region. The regression resulted in a gap of considerable duration in the succession. In some parts of the region the strata corresponding to the Lau Event are completely missing and the positive δ13C shift has not been recorded. The event caused dramatic decrease in faunal diversity, mass burial of Pentamerid brachiopods and extinction of reefal ecosystems. The crisis was followed by renovation of faunas during transgression in Přídolí. Two negative δ13C excursions mark the Late Ludlow sea level lowstand in the region.

An Early Carboniferous regression related to the Mid-Tournaisian Event resulted in rapid drop in abundance and diversity of conodonts, foraminifers and brachiopods. Following the event transgression in the early crenulata time was marked by appearance of rich faunas and new morphologies in the conodont succession. The Early Crboniferous Event is also marked by a negative δ13C shift.

Both events resulted in decrease in diversity and abundance of faunas and were followed by flourishing of the benthic and planktic associations. The events led to similar negative δ13C shifts probably caused by decreasing in organic carbon burial rate.